

The combustion of fixed carbon to form carbon monoxide is an exothermic reaction, and carbon treated thus evolves in the producer about 30 per cent of the heat energy it would yield if burned completely to carbon dioxide. A large part of this heat is lost in such circumstances through radiation. Hence has arisen the practice of introducing into the producer with the air blast a certain amount of steam. Steam, when brought into contact with incandescent carbon, is decomposed with formation of hydrogen and carbon monoxide. This is a heat-absorbing, or endothermic, reaction, and by careful combination with the other can be made to effect a considerable reduction of the heat loss occurring in the producer. It should be noted that this is the only benefit resulting from the use of steam (apart from any increase in by-products). It does not effect a larger yield of heat actually from the fuel, but it lessens the heat loss in the producer, utilizing a part in the formation of hydrogen which by its subsequent combustion will set free an equal amount to that absorbed from the producer.

Water Gas.—When the exothermic reaction $2C + O_2 = 2CO$ is employed to raise the temperature of the coke in a producer to incandescence, and the air blast is then shut off and steam passed in alone, the endothermic reaction $H_2O + C = H_2 + CO$ takes place with, in consequence, a continuous fall in the temperature of the coke mass. As the temperature falls, the gases become more and more contaminated with carbon dioxide with concomitant lowering of heating value, so that the steam-supply must be turned off and the temperature of the coke again raised by the introduction of air. The mixture of hydrogen and carbon monoxide got in this way without admixture of producer gas is called water gas.

Mond Gas.—When a gas producer is fed with air and steam and the steam is kept in large excess—about 2½ tons per ton of coal—a large yield of valuable by-products is obtained from the coal along with a gas of about 145 B.Th.U. per cubic foot. As a result of the cooling produced by the steam the gas contains a high proportion of carbon dioxide, but the efficiency of the process is high. The gaseous mixture obtained in this way is known as Mond gas.

Examples of these different types of gaseous fuel are given below:

	Coal Gas (i).	Coal Gas (?).	Producer Gas.	Water Gas.	Steam-fed Producer Gas.	Mond Gas.	Blast-furnace Gas (Coke Bed).	Blast-furnace Gas (Coal Fed).
Hydrogen	54.0	47.0	4.4%	48.4%	12.0	27.0	27%	6.8%
Methane	34.0	36.0	—	0.5	3.43	1.80	0.2	3.0
Ethylene.	3.0	4.3	—	—	—	0.40	—	—
Benzene	1.0	0.5	—	—	—	—	—	—
Carbon	6.0	8.0	25.6	43.6	22.32	11.00	28.6	27.0
Carbon dioxide	—	1.6	—	3.5	6.18	17.10	11.4	7.2
Nitrogen	2.0	2.5	65.7	4.0	55.96	42.50	57.1	56.0
	100.0	100.0	100.0	100.0	100.00	100.00	100.0	100.0